A small amount of glaze had formed by 7 a.m. and increased in thickness as long as the rain fell. In the late afternoon the coating of sleet and ice on the ground was 1 inch thick, and the glaze on trees, shrubbery, wires, etc., ½ to ¾ of an inch thick, except on the under side of wires and branches, where it was about ¼ of an inch. Icicles by the millions were suspended close together from wires, fences, bridge railings, eaves of buildings, and other horizontal objects. These were from 2 to 4 inches long on wires and as much as 10 or 12 inches on other objects, and contributed enormously to the total weight of the ice and the consequent damage. The northern walls of buildings were plastered at least half an inch thick with the ice, and in some cases as much as two thirds of an inch. Shrubbery, weeds, and grass were incased. The station anemometer showed less speed under the weight of the ice coating, and when this was removed at 2:45 p.m. the velocity showed an appreciable increase. Each cup of the anemometer had suspended horizontally from it an icicle 3 inches or more in length.

The scene presented by the ice was one of rare beauty, even during its formation when the sky was overcast and the rain and sleet falling, but early the following day, under a cloudless sky and in bright sunshine, the earth was indeed a fairyland of brilliance. Similar scenes and conditions were noted throughout the central counties of the State, the storm being particularly heavy in the area known as the Central Basin and in the upper Cumberland Valley. However, very little ice remained at sunset of the next day.

The damage was enormous, particularly to trees and telephone, telegraph, and light wires and poles. Trees as much as 18 inches in diameter were split and some were uprooted, while others were broken off near the ground. Thousands of trees had large limbs broken, many falling upon light and power lines and disrupting the services. The damage was severe to evergreen trees, including magnolia, cedar, and pine. Fruit trees suffered considerably. Fortunately, the wind diminished as the ice attained its greatest thickness and remained light throughout the night and the following day.

The Southern Bell Telephone & Telegraph Co. estimates its loss in Tennessee roughly at $250,000. They report some 4,100 poles down, many of them small. The Tennessee Electric Power Co. also suffered severe losses, as did the telegraph companies and the local telephone companies. It is believed that the total losses from the ice storm, exclusive of trees, will approximate $350,000, and the removal of broken trees and other debris from the streets and highways was a big task.

BIBLIOGRAPHY

C. FITZHUGH TALMAN, *in charge of Library*

RECENT ADDITIONS

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SOLAR OBSERVATIONS

SOLAR RADIATION MEASUREMENTS DURING MARCH, 1934

By IRVING F. HAND, Assistant in Solar Radiation Investigations

For a description of instruments employed and their exposures, the reader is referred to the January 1932 REVIEW, page 26.

Table 1 shows that solar radiation values were close to normal at all three Weather Bureau stations.

Table 2 shows a deficiency in the total solar radiation received on a horizontal surface at Washington, Madison, Pittsburgh, Fairbanks, and Miami, and an excess at all other stations.

Polarization observations obtained at Washington on 5 days give a mean of 61 percent with a maximum of 65 percent on the 15th. Both of these values are close to the March normals. At Madison observations were taken on the 27th only and the value then obtained, 60 percent, is below the mean for March.

TABLE 1.—*Solar radiation intensities during March 1934*

[Gram-calories per minute per square centimeter of normal surface]

Washington, D.C.

Date	Sun's zenith distance										
	8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass									Local mean solar time
		A.M.					P.M.				
	e.	5.0	4.0	3.0	2.0	1.0[1]	2.0	3.0	4.0	5.0	e.
	mm	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm*
Mar. 1	2.06	0.71	0.79	0.90	1.20	1.44					2.26
Mar. 9	2.06		.68	.89	1.12	1.48					2.16
Mar. 12	1.78	.62	.78	.93	1.12	1.55	1.13	0.94			1.52
Mar. 13	2.74	.68	.85	1.03	1.22	1.53	1.14				3.45
Mar. 15	1.78	.92	1.07	1.19	1.38	1.63	1.33	1.18			1.68
Mar. 19	2.16						1.24				1.96
Mar. 29	3.45	.68	.87	1.06	1.21	1.54					2.49
Mar. 30	4.37				1.20						3.45
Means		**.72**	**.84**	**1.00**	**1.21**	**1.53**	**1.21**	**(1.06)**			
Departures		**−.01**	**+.03**	**+.05**	**+.05**		**+.08**	**+.12**			

Madison, Wis.

Date	e.	5.0	4.0	3.0	2.0	1.0[1]	2.0	3.0	4.0	5.0	e.
Mar. 7	2.16		1.17	1.32	1.47	1.60	1.25				2.16
Mar. 10	.86			1.21							.86
Mar. 14	1.52		1.17	1.30		1.57					2.16
Mar. 15	2.62				.84						2.62
Mar. 16	2.87	0.94	1.04	1.21							2.87
Mar. 19	2.77	.66	.83			1.56	1.29				2.77
Mar. 21	3.63	.91	1.03	1.17	1.31						3.63
Mar. 24	1.19		.84			1.57					1.19
Mar. 27	1.52		1.09	1.22	1.37	1.59	1.07				1.52
Means		**.84**	**1.02**	**1.24**	**1.27**		**1.20**				
Departures		**−.11**	**−.02**	**+.07**	**−.05**		**−.10**				

TABLE 1.—*Solar radiation intensities during March 1934*—Contd.

Lincoln, Nebr.

Date	Sun's zenith distance										
	8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass									Local mean solar time
		A.M.					P.M.				
	e.	5.0	4.0	3.0	2.0	1.0[1]	2.0	3.0	4.0	5.0	e.
	mm	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm*
Mar. 2	3.81		0.87	1.01	1.35	1.53	1.35	1.22	1.12	0.94	4.95
Mar. 6	2.36				.99						1.88
Mar. 8	1.78		.82	.94	1.28						3.15
Mar. 12	4.57						1.34	1.16	1.04	.90	4.75
Mar. 19	2.62		.90	1.07	1.26	1.46		1.04	.91	.81	4.95
Mar. 21	4.37		.81	.94	1.14	1.50	1.25	1.16	1.00	.89	3.81
Mar. 24	1.37					1.58					1.68
Mar. 25	1.96	0.76	.89	1.08	1.28						3.00
Mar. 27	2.16	.74	.89	1.17	1.38	1.54					1.88
Means		(.75)	.86	**1.04**	**1.24**	**1.52**	**1.31**	**1.14**	**1.02**	**.88**	
Departures		−.08	−.06	+.01	−.03		+.03	+.05	+.08	+.06	

Blue Hill, Mass.

Date	e.	5.0	4.0	3.0	2.0	1.0[1]	2.0	3.0	4.0	5.0	e.
Mar. 1	1.2				1.33	1.46	1.12	0.72			1.0
Mar. 5	7.3					1.36	1.18	1.02			6.6
Mar. 6	4.0					1.56	1.21	.94			1.5
Mar. 12	1.4				1.35	1.56	1.35	1.19	0.89		1.2
Mar. 14	4.6				.98	.99					3.7
Mar. 16	3.4					1.49	1.01				2.8
Mar. 17	3.4				1.12						3.8
Mar. 18	6.5				.76	1.27					6.9
Mar. 21	2.0				1.27	1.43					1.8
Mar. 25	2.9				1.12	1.45	1.15	.97	.91		2.0
Mar. 26	3.7				1.08	1.33					2.1
Mar. 29	3.9				1.13	1.42	1.22	.95	.76		2.6
Means					**1.13**	**1.39**	**1.18**	**.96**	**.85**		

[1] Extrapolated.

TABLE 2.—*Average daily totals of solar radiation (direct+diffuse) received on a horizontal surface*

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Pittsburgh	Fairbanks	Twin Falls	La Jolla	Miami	New Orleans	Riverside	Blue Hill	Mount Washington
	Gram calories per square centimeter														
1934	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Feb. 26	274	254	388	207	226	370	116	106	237	372	291	248	402	302	322
Mar. 5	261	356	369	257	229	463	177	146	429	286	371	342	451	302	[1] 229
Mar. 12	412	314	398	256	346	461	258	168	448	403	356	408	453	390	[1] 233
Mar. 19	249	392	383	400	342	456	204	186	449	363	512	403	397	442	[1] 365
Mar. 26	308	224	399	198	270	528	182	318	332	456	408	387	484	306	405
	Departures from weekly normals														
Feb. 26	−15	−26	+46	±0	−13	−10	−60	−29	−58	+36	−83	−28			
Mar. 5	−65	+54	+15	+51	−40	+73	−23	−13	+104	−47	−24	+38			
Mar. 12	+80	−2	+22	+45	+67	+51	+39	−18	+100	+55	−67	+88			
Mar. 19	−94	+71	−11	+163	+58	+[illegible]	−18	−35	+89	−12	−56	+80			
Mar. 26	−38	−128	−8	−23	+18	+42	−59	+43	−38	+42	−58	+47			
	Accumulated departures on April 2														
	−1,456	−903	−231	+2,359	+2,709	+565	−1,806	−280	+833	+2,219	−1,673	+2,926			

[1] Interpolated values. On March 8 pyrheliometer stem broke inside cover; new instrument installed March 30.

TABLE 3.—*Total, I_m and screened, I_y, I_Y, solar radiation intensity measurements, obtained during March 1934, and determinations of the atmospheric turbidity factor, β and water-vapor content, w = depth in centimeters, if precipitated*

American University, Washington, D. C.

Date and hour angle	Solar altitude	Air mass	I_m	I_y	I_r	βI_{m-r}	βI_{y-r}	β_{mean}	$\frac{I_{w=0}}{1.94}$	$\frac{I_{w=0}-I_m}{1.94}$	w
									Percentage of solar constant		
Mar. 12	° ′	m	gr. cal.	gr. cal.	gr. cal.						cm
3:26 a	26 35	2.23	1.075	0.795	0.678	0.103	0.139	0.121	58.9	2.6	0.1
3:20 a	27 34	2.15	1.082	.796	.679	.103	.143	.123	59.4	3.6	.1
2:22 a	36 38	1.67	1.207	.921	.750	.120	.082	.101	68.0	5.8	.2
2:17 a	37 20	1.65	1.196	.924	.752	.176	.082	.129	64.3	2.7	.1
0:54 a	45 57	1.39	1.342	.934	.759	.066	.102	.089	74.0	4.9	.2
0:48 a	46 20	1.38	1.345	.939	.761	.068	.088	.078	75.1	5.8	.3
Mar. 13											
1:12 a	44 56	1.41	1.333	.927	.717	.040	.028	.034	82.0	13.5	3.6
1:08 a	45 15	1.41	1.338	.932	.720	.040	.026	.033	82.4	13.5	3.6
0:56 a	46 10	1.39	1.344	.932	.727	.042	.038	.040	81.7	12.5	3.1
0:53 a	46 22	1.38	1.344	.932	.727	.042	.040	.041	81.6	12.4	2.7
1:39 p	42 15	1.49	1.300	.958	.765	.087	.059	.073	75.5	8.5	.5
1:43 p	41 37	1.50	1.300	.959	.763	.085	.053	.069	76.3	9.3	.5
1:48 p	41 16	1.52	1.321	.953	.763	.065	.061	.063	76.8	8.7	.5
3:46 p	23 20	2.52	1.044	.771	.630	.068	.078	.073	65.2	11.4	1.4
3:50 p	22 37	2.59	1.012	.767	.627	.074	.076	.075	62.9	10.1	1.0
Mar. 29											
0:40 a	53 16	1.25	1.520	1.070	.860	.035	.039	.037	82.8	4.5	.2
0:36 a	53 29	1.24	1.492	1.070	.858	.058	.042	.050	81.6	4.7	.3

Sky conditions at time radiation measurements were made. International meteorological symbols have been employed to designate clouds, wind, and optical phenomena, hz for haze, v for visibility, 0 for solar corona.

Mar. 12. Temp., −6 C.; wind, S. 8; v., 12; stopped by clouds in afternoon.

Mar. 13.—Temp., 4 C.; wind, SW. 10; v., 20; stopped by clouds late afternoon.

Mar. 29.—Temp., 5 C.; wind, N. 8; v. 30-50; blast furnace smoke at times; clouds late afternoon.

Blue Hill Meteorological Observatory of Harvard University

Date and hour angle from apparent noon 1934	Solar altitude	Air mass	I_m	I_y	I_r	βI_{m-r}	βI_{y-r}	β_{mean}	$\frac{I_{w=0}}{1.94}$	$\frac{I_{w=0}-I_m}{1.94}$	w
									Percentage of solar constant		
Mar. 1	° ′		gr. cal.	gr. cal.	gr. cal.						mm
0:05 a	40 08	1.55	1.331	0.944	0.760	0.039	0.075	0.057	77.2	9.8	7.0
2:14 p	31 30	1.91	1.189	.878	.689	.070	.045	.058	73.3	13.1	27.0
3:19 p	22 45	2.58	1.114	.817	.656	.051	.048	.050	68.8	12.4	17.0
Mar. 2											
0:13 a	40 26	1.54	1.180	.802	.637	.072	.104	.088	72.1	12.4	24.0
Mar. 5											
0:28 p	41 15	1.52	1.306	.913	.713	.052	.028	.040	80.9	14.7	40.0
0:37 p	40 57	1.53	1.272	.887	.689	.053	.045	.049	78.9	14.4	46.0
Mar. 12											
2:13 a	35 20	1.73	1.447	1.005	.788	.011	.010	.010	84.8	11.1	14.0
1:05 a	42 05	1.49	1.437	1.012	.797	.033	.027	.030	82.8	9.6	5.6
0:28 p	45 57	1.39	1.451	1.021	.795	.032	.006	.019	84.7	10.8	15.0
1:54 p	42 46	1.47	1.423	.996	.795	.041	.029	.035	82.2	9.7	8.3
3:36 p	23 41	2.48	1.252	.883	.728	.057	.066	.062	67.0	3.2	1.9
Mar. 14											
2:12 a	36 10	1.69	.978	.702	.562	.132	.144	.138	62.9	13.1	29.0
1:09 a	43 03	1.46	1.011	.727	.580	.153	.155	.154	64.5	13.0	32.0
0:21 p	44 56	1.41	1.012	.719	.577	.160	.173	.166	63.7	12.1	24.0
Mar. 16											
1:23 a	42 09	1.49	1.239	.854	.670	.094	.073	.084	70.2	7.0	3.0

TABLE 3.—*Total, I_m and screened, I_y, I_Y, solar radiation intensity measurements, obtained during March 1934, and determinations of the atmospheric turbidity factor, β and water-vapor content, w = depth in centimeters, if precipitated*—Continued

Blue Hill Meteorological Observatory of Harvard University—Continued

Date and hour angle from apparent noon 1934	Solar altitude	Air mass	I_m	I_y	I_r	βI_{m-r}	βI_{y-r}	β_{mean}	$\frac{I_{w=0}}{1.94}$	$\frac{I_{w=0}-I_m}{1.94}$	w
									Percentage of solar constant		
Mar. 17	° ′		gr. cal.	gr. cal.	gr. cal.						cm
2:42 a	33 15	1.82	1.179	0.833	0.674	0.071	0.098	0.084	69.4	9.2	5.5
1:42 a	40 41	1.53	1.236	.861	.671	.055	.042	.048	79.1	16.0	-----
0:42 a	45 21	1.40	1.205	.859	.662	.086	.048	.067	77.3	15.8	-----
0:18 p	46 10	1.39	1.151	.805	.622	.089	.063	.076	75.9	17.2	-----
Mar. 18											
2:02 a	38 45	1.60	.948	.692	.552	.158	.188	.173	59.2	10.8	13.0
Mar. 21											
2:41 a	34 30	1.76	1.294	.914	.734	.043	.047	.045	77.5	11.3	15.0
1:44 a	41 53	1.49	1.298	.914	.730	.074	.073	.074	75.1	8.7	5.0
1:14 a	44 56	1.41	1.319	.917	.739	.067	.088	.078	76.4	8.9	5.2
0:51 p	46 25	1.38	1.284	.903	.715	.075	.071	.073	76.3	7.6	4.8
Mar. 23											
0:59 a	46 36	1.38	1.421	1.014	.805	.052	.032	.042	82.2	9.4	7.7
Mar. 25											
1:10 a	46 36	1.38	1.335	.954	.775	.062	.081	.072	73.3	4.8	1.6
0:28 p	49 02	1.32	1.384	.954	.775	.062	.061	.062	79.0	8.0	4.4
2:54 p	33 52	1.79	1.209	.876	.705	.071	.074	.072	72.0	10.0	8.6
4:35 p	16 48	3.45	.924	.729	.598	.075	.062	.068	58.1	10.7	6.3
Mar. 26											
0:47 a	48 31	1.33	1.186	.830	.671	.116	.108	.112	72.0	11.6	21.0
0:37 p	49 04	1.32	1.174	.804	.641	.099	.070	.084	72.1	11.9	24.4
Mar. 29											
0:55 p	49 11	1.32	1.276	.901	.702	.078	.053	.066	78.5	12.9	34.4

Atmospheric Conditions During Solar Radiation Measurements

Date and time from apparent noon	Wind	Visibility	Sky blueness	Clouds	Remarks
March 1934					
1, 0:05 a	SSW 4	------	3	3 Ci, Cist	Dns. hz. in all dir.
2, 0:13 a					Sky clear only ½ hr.
5, 0:28 p	WNW 4	------	4	Clear to 3 p.m.	Cicu. formed rapidly. Covered sun at 2:56 p.m.
12, 2:13 a	WNW 5	------	3	0 clouds	
1:05 a	WNW 3	------	3	0 clouds	
0:28 p	W 3	------	3	Few Cu	
3:35 p	W 3	------	4	Trace, Cicu, Frcu.	
14, 2:12 a	SSW 3	------	2	0 clouds	Hz. in all directions.
0:21 p	WNW 4	------	2	0 clouds	Do.
16, 1:23 a	SSW 4	------	3	3 Ci, Cist	Thin film Ci over sun.
17, 2:42 a	WSW 1-2	------	3	0 clouds	Lt. Hz.
0:18 p	SSW 2	------	3	0 clouds	
18, 2:02 a	S 6	------	2	0 clouds	Hz. in all directions.
21, 2:41 a	ENE 1	------	3	0 clouds	Heavy haze.
0:51 p	SSE 2	7	3	Few Ci, Cicu	Thin Ci film over sun.
23, 0:59 a					
25, 1:10 a	WNW 3	------	3	0 clouds	Moderate Hz.
0:28 p	WNW 3	7	3	Few Cu, Frcu	Possibly thin cld. film over sun.
2:54 p	WNW 2	7-8	2	Few Frcu	Moderate Hz.
26, 0:47 a	SSE 3	------	3	Few Ci	Ci. low and indefinite in form.
0:37 p	S 5	------	3	Few Ci, Ast	Thickening Ci. fibers over sun.
29, 0:55 p	NW&N 2	7	4	0 clouds	Hz. in all directions.

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U.S. Navy, Superintendent U.S. Naval Observatory. Data furnished by the U.S. Naval Observatory in cooperation with Harvard and Mount Wilson Observatories. Difference in longitude is measured from the central meridian, positive west. North latitude is positive. Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area for each day includes spots and groups]

Date	Eastern standard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longitude	Longitude	Latitude	Spot	Group		
1934	h. m.	°	°	°				
Mar. 1	11 0	No spots						U.S. Naval.
Mar. 2	11 15	No spots						Mt. Wilson.
Mar. 3	11 20	No spots						U.S. Naval.
Mar. 4	11 45	−12.0	180.4	+0.5	3		3	Mt. Wilson.
Mar. 5	11 34	No spots						U.S. Naval.
Mar. 6	11 18	No spots						Do.
Mar. 7	12 50	−64.0	88.4	−27.0	2			Mt. Wilson.
		−26.0	126.4	−3.0		21	23	
Mar. 8	13 10	−54.0	84.9	−28.0		4		Do.
		−11.0	127.9	−3.0		37	41	
Mar. 9	11 18	−40.0	86.8	−27.5		9		U.S. Naval.
		+2.0	128.8	−3.0		31	40	
Mar. 11	12 28	No spots						Do.
Mar. 12	11 16	No spots						Do.
Mar. 13	11 22	No spots						Do.
Mar. 14	11 0	No spots						Mt. Wilson.
Mar. 15	11 6	No spots						U.S. Naval.
Mar. 16	13 17	No spots						Do.
Mar. 17	11 10	No spots						Do.
Mar. 18	10 50	No spots						Do.
Mar. 19	11 54	No spots						Mt. Wilson.
Mar. 20	11 33	No spots						U.S. Naval.
Mar. 21	11 20	No spots						Do.
Mar. 22	10 58	No spots						Mt. Wilson.
Mar. 24	10 56	No spots						Do.
Mar. 25	12 9	No spots						U.S. Naval.
Mar. 26	10 30	+3.0	266.1	−28.0	6		6	Mt. Wilson.
Mar. 27	9 45	No spots						Do.
Mar. 28	11 35	No spots						Do.
Mar. 29	11 10	No spots						U.S. Naval.
Mar. 30	11 8	No spots						Do.
Mar. 31	11 0	No spots						Mt. Wilson.
Mean daily area for March.							4	

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR MARCH 1934

(Dependent alone on observations at Zurich and its station at Arosa)

[Data furnished through the courtesy of Prof. W. Brunner, Eidgenössische Sternwarte, Zurich, Switzerland]

March 1934	Relative numbers	March 1934	Relative numbers	March 1934	Relative numbers
1		11	15	21	0
2	0	12	7	22	0
3	0	13	0	23	0
4	7	14	0	24	0
5	0	15	0	25	7
6	*Ec* 7	16	0	26	7
7	9	17	0	27	0
8	19	18	7	28	0
9	*a* 22	19	0	29	7
10	12	20	0	30	7
				31	0

Mean: 30 days—4.4.

a = Passage of an average-sized group through the central meridian.
c = New formation of a center of activity: *E*, on the eastern part of the sun's disk; *W*, on the western part; *M*, in the central zone.

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. Little, in charge]

By L. T. SAMUELS

Free-air temperatures during March averaged below normal at all levels at Omaha and Pembina; at the upper levels at Pensacola and San Diego; and lower levels at Cleveland and Washington (table 1). Elsewhere the temperature departures were positive. Relative humidity departures for the month were mostly negative, the largest positive departures occurring at Pensacola.

Free-air resultant wind directions were practically normal over the entire country with some excess of southerly components along the middle Pacific coast (table 2). Resultant velocities were mostly below normal over the southern half of the country and above normal over the northern half.